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EXAMINER	
QUASH, ANTHONY G	
ART UNIT	PAPER NUMBER
2881	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/981,280	STARK, PETER RANDOLPH HAZARD	
	Examiner	Art Unit	
	Anthony Quash	2881	

-- Th MAILING DATE of this communication appears on the cover sh t with the correspond nc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *21 November 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 14-20 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, line 10 of claim 14 recites "wavelength of said electromagnetic radiation, and". It is unclear from the claim what the applicants intend to have inserted after the word "and". This renders the claims indefinite. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6,8,21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim [936]. As per claim 1, Kim [936] teaches an apparatus for directing electromagnetic energy onto a target in a small area of illumination, the apparatus comprising, in combination, a source of electromagnetic radiation (100) a substantially planar light barrier (101-118) interposed between the source (100) and said target (auxiliary layers) the light barrier (101-118) defining a first electrically conductive surface

(102) on the side of the barrier (101-118) exposed to incident light from the source (100) and further defining a second surface (118) on the opposite side of the barrier (101-118), the second surface being position adjacent to the target (auxiliary layer), one or more apertures (112) through the light barrier, each of the apertures (112) passing from the first surface (102) to the second surface (118) and having a width in at least one dimension that is smaller than one wavelength of the electromagnetic radiation. See Kim [936] abstract, figs.4-5, 8,11-14, columns 1-2, col. 4 lines 10-16, 50-67, column 5, col. 8 line 14-50, col. 10 lines 15-35, 50-55, col. 12 lines 23-55 and col. 18 lines 1-5. Although Kim [936] does not explicitly state means for confining the extent of the electronic excitation induced in the second surface to the portion of the second surface that is near each of the apertures, it is the examiner' view that Kim [936] does teach/provide means for confining the extent of the electronic excitation induced in the second surface to the portion of the second surface that is near each of the apertures. This is made evident by Kim [936] teaching varying the refractive index between the surfaces, and inserting air or another dielectric material adjacent the second surface. Since it is known that inserting a dielectric adjacent the metal surface will aid in confining the electronic excitation, it is the examiner's view that the insertion of dielectric/air between the metal layer and the support layer mentioned in Kim [936] col. 5 lines 44-68, would in fact confine the excitation to the area near the aperture exits. See Kim [936] figs. 1-2B, 8, 11-13B, columns 1-2, col. 5, lines 44-68, col. 6 lines 1-7, col. 8 line 14-50, col. 10 lines 15-35, 50-55, col. 12 lines 23-55 and col. 18 lines 1-5. In fact, the applicant teaches this structure being used to achieve the effect of confining

the electronic excitation to the second surface. See applicants' specification, page 8 paragraphs 3-4, page 9 paragraphs 4, and the continuing paragraph at the top of page 10.

As per claim 2, Kim [936] teaches means for limiting the extent of the electronic excitation induced in the second surface (118) in the vicinity of each of the apertures (112) comprises a barrier material (silver film/plate) that is opaque to the transmission of the electromagnetic radiation formed in the light barrier (101-118) and positioned between the first electrically conductive surface (102) and the second surface (118). See Kim [936] figs.4-5, 8,11-14, col. 1 lines 10-30, col. 4 lines 60-67 and col. 10 lines 25-35.

As per claim 3, Kim [936] teaches the first electrically conductive surface being formed by a layer of conductive metal (102) having a thickness greater than the skin depth of the metal (silver) at the frequency of the electromagnetic radiation. See Kim [936] figs.4-5, 8,11-14, col. 1 lines 13-30, and col. 4 lines 60-67.

As per claim 4, Kim [936] teaches all aspects of the claim except for specifically stating that the layer of conductive metal extends into the interior sidewalls of each of the apertures terminating at the second surface in a limited area in the vicinity of each of the apertures. It would have been obvious to have the layer of conductive metal extending into the interior side walls of each of the apertures terminating at the second surface in a limited area in the vicinity of each of the apertures in order to have the transmission of light be dependent upon the diameter of aperture so that one could

decrease the transmission maxima and width by increasing the thickness of the metal as taught in Kim [936]. See Kim [936] col. 1 lines 10-30 and col. 4 lines 60-67.

As per claim 5, Kim [936] teaches a confined conductive area (117) at the second surface (118) in the vicinity of each of the apertures (112) whereby surface excitations at the second surface (118) are confined to the vicinity of each of the apertures (112). See Kim [936] figs.4-5, 8,11-14, col. 12 lines 24-50.

Claims 6, is rejected for being dependent on a rejected claim.

As per claim 8, Kim [936] teaches the electrically conductive (102) surface is constructed of a layer of a first metal and wherein the barrier material is different characterized in that conductive surface and the barrier material have substantially different resonances. See Kim [936] figs.4-5, 8,11-14, col. 5 lines 20-67, and col. 8 lines 14-30. However, Kim [936] does not specifically state that barrier material is a metal different than that of the first metal. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the barrier material is a metal different than that of the first metal, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim [936]. As per claim 21, Kim [936] teaches the method of directing electromagnetic radiation from a source to a confined area on a target, which comprises, in combination, the steps of: interposing a radiation barrier (101-118) between the source (100) and the target (auxiliary layers), the radiation barrier (101-118) comprising a substantially planar

material (silver) that is opaque to the electromagnetic radiation defining a first surface (102) closest to the source (100) and an opposing surface (118) closest to the target (auxiliary layers), the radiation barrier (101-118) having an aperture (112) therethrough having a width in at least one dimension which is smaller than one wavelength of the electromagnetic radiation, the barrier (101-118) further comprising a layer of electrically conductive metal (silver) covering the first surface (102), and activating the source (100) to direct the radiation from the source (100) onto the layer of electrically conductive metal (silver) to induce surface excitations in the layer of metal, and positioning the aperture (112) adjacent to the target (auxiliary layers) such that electromagnetic energy passing through the aperture induces surface excitations in the confined conductive area to illuminate the target with the small area of illumination. See Kim [936] abstract, figs.4-5, 8,11-14, columns 1-2, col. 4 lines 10-16, 50-67, column 5, col. 8 line 14-50, col. 10 lines 15-35, 50-55, col. 12 lines 23-55 and col. 18 lines 1-5. Although Kim [936] does not explicitly state a confined conductive area located at the second surface adjacent to each of the apertures, it is the examiner's view that Kim [936] does provide equivalent means. This is made evident by Kim [936] teaching varying the refractive index between the surfaces, and inserting air or another dielectric material adjacent the second surface. Since it is known that inserting a dielectric adjacent the metal surface will aid in confining the electronic excitation, it is the examiner's view that the insertion of dielectric/air between the metal layer and the support layer mentioned in Kim [936] col. 5 lines 44-68, would in fact confine the excitation to the area near the aperture exits. See Kim [936] figs. 1-2B, 8, 11-13B, columns 1-2, col. 5, lines 44-68, col. 6 lines 1-7,

col. 8 line 14-50, col. 10 lines 15-35, 50-55, col. 12 lines 23-55 and col. 18 lines 1-5. In fact, the applicant teaches this structure being used to achieve the effect of confining the electronic excitation to the second surface. See applicants' specification, page 8 paragraphs 3-4, page 9 paragraph 4, and the continuing paragraph at the top of page 10.

Claims 22-23 are rejected for being dependent on rejected claims.

As per claim 24, Kim [936] teaches all aspects of the claim except for specifically stating that the target is an optical data storage medium. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the target be an optical data storage medium in order record transmission of light for different dielectric mediums so as to determine which dielectric medium induce the greatest number of surface plasmons.

As per claim 25, Kim [936] teaches all aspects of the claim except for specifically stating the target being a sample placed between the objective lens of a microscope and the second surface. Kim [936] does however teach that other dielectric materials can be placed between the second surface (118) and the first surface (102). See Kim [936] col. 5 lines 45-67. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the target be a sample placed between the objective lens of a microscope and the second surface in order to focus the light and aid in analyzing the material by observing the surface plasmons induced in the second material by the transmitted light.

Claims 7,9-13,26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim [936] in view of Thio [298]. As per claim 7, Kim [936] teaches the barrier material being a dielectric. See Kim [936] col. 7 lines 60-65, col. 1 lines 35-40, and 60-67. However, Kim [936] does not specifically state the dielectric exhibit a bandgap that is larger than the frequency of the electromagnetic radiation. Thio [298] does teach the bandgap being used to determine the long-wavelength cutoff. See Thio [298] col. 6 lines 5-30. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the dielectric exhibit a bandgap that is larger than the frequency of the electromagnetic radiation in order to optimize the materials used as taught in Thio [298].

As per claim 9, Kim [936] discloses the first electrically conductive surface being formed by a layer of conductive metal (102) having a thickness greater than the skin depth of the metal (silver) at the frequency of the electromagnetic radiation. See Kim [936] figs.4-5, 8,11-14, col. 1 lines 13-30, and col. 4 lines 60-67.

As per claim 10, Kim [936] teaches all aspects of the claim except for specifically stating that the layer of conductive metal extends into the interior sidewalls of each of the apertures terminating at the second surface in a limited area in the vicinity of each of the apertures. It would have been obvious to have the layer of conductive metal extending into the interior side walls of each of the apertures terminating at the second surface in a limited area in the vicinity of each of the apertures in order to have the transmission of light be dependent upon the diameter of aperture so that one could

decrease the transmission maxima and width by increasing the thickness of the metal as taught in Kim [936]. See Kim [936] col. 1 lines 10-30 and col. 4 lines 60-67.

As per claim 11, Kim [936] discloses a confined conductive area (117) at the second surface (118) in the vicinity of each of the apertures (112) whereby surface excitations at the second surface (118) are confined to the vicinity of each of the apertures (112). See Kim [936] figs.4-5, 8,11-14, col. 12 lines 24-50.

Claims 12, is rejected for being dependent on a rejected claim.

As per claim 13, Kim [936] teaches the electrically conductive (102) surface is constructed of a layer of a first metal and wherein the barrier material is different characterized in that conductive surface and the barrier material have substantially different resonances. See Kim [936] figs.4-5, 8,11-14, col. 5 lines 20-67, and col. 8 lines 14-30. However, Kim [936] does not specifically state that barrier material is a metal different than that of the first metal. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the barrier material is a metal different than that of the first metal, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

As per claim 26, Thio [298] teaches the target being a photoresist, which is exposed by the electromagnetic radiation in a lithographic process. See Thio [298] col. 3 lines 10-30, and col. 9 lines 1-11.

Claims 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim [936] in view of Ebbesen [033]. As per claim 14, Kim [936] teaches a device for

directing small areas of illumination onto a target comprising, in combination, a source of electromagnetic radiation (100), a substantially planar light barrier (101-118) positioned between the source (100) and the target (auxiliary layers), the light barrier (101-118) being opaque to the electromagnetic radiation and defining a first surface (102) facing the source (100) and a second surface (118) facing the target (auxiliary layer), and further comprised of a layer of metal (silver, gold, 102) affixed to the first surface (102) of the light barrier, an array of one or more apertures (112) passing through the layer of metal and the light barrier (101-118) each of the apertures having a width in at least one direction which is shorter than the wavelength of the electromagnetic radiation, and a confined area in the vicinity of each of the apertures at the second surface (118). See Kim [936] abstract, figs.4-5, 8,11-14, columns 1-2, col. 4 lines 10-16, 50-67, column 5, col. 8 line 14-50, col. 10 lines 15-35, 50-55, col. 12 lines 23-55 and col. 18 lines 1-5. However, Kim [936] does not specifically state that the confined conductive area be electromagnetically coupled to the layer of metal at the first surface such that excitations are induced in the confined conductive area to produce the small areas of illumination. Ebbesen [033] does teach that the confined conductive area be electromagnetically coupled (82) to the layer of metal (20) at the first surface such that excitations are induced in the confined conductive area to produce the small areas of illumination. See Ebbesen [033] abstract, figs. 4-7,9-15B, col. 1 lines 10-25, col. 2 lines 45-67, col. 3 lines 1-38, col. 5 lines 10-35, column 6, col. 7 lines 1-5, 40-67 col. 8 lines 1-15, 40-67, columns 9-10, col. 13 lines 45-65, and column 14. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention

was made to have the confined conductive area be electromagnetically coupled (82) to the layer of metal (20) at the first surface such that excitations are induced in the confined conductive area to produce the small areas of illumination in order to better collect light and transport it to a photodetector as taught in Ebbesen [033].

As per claim 15, Kim [936] teaches the light barrier having a thickness on the order of 200 nm. See Kim [936] col. 6 lines 1-5 and col. 10 lines 15-20.

As per claim 16, Kim [936] in view of Ebbesen [033] teach all aspects of the claim except for specifically stating the light barrier being selected from a group of dielectric materials including germanium, silicon dioxide, silicon nitride, alumina, and chromia. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the light barrier being selected from a group of dielectric materials including germanium, silicon dioxide, silicon nitride, alumina, and chromia, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

As per claim 17, Kim [936] teaches each of the one or more apertures (112) having a width in at least one direction that is between 10 nm and the dimension defined by the Rayleigh criterion for the frequency of electromagnetic radiation. See Kim [936] figs. 12A-13B, and col. 10 lines 25-35.

As per claim 18, Kim [936] teaches the first electrically conductive surface being formed by a layer of conductive metal (102) having a thickness greater than the skin depth of the metal (silver) at the frequency of the electromagnetic radiation. See Kim [936] figs.4-5, 8,11-14, col. 1 lines 13-30, and col. 4 lines 60-67.

As per claim 19, Kim [936] teaches the metal being selected from a group consisting of gold, silver, aluminum, beryllium, rhenium, osmium, potassium, rubidium, cesium, rhenium oxide, tungsten oxide, and copper. See Kim [936] col. 4 lines 50-67 and col. 10 lines 25-35.

As per claim 20, Kim [936] in view of Ebbesen [033] teach all aspects of the claim except for specifically stating except for specifically stating that each of the apertures in the array being a slit having a long dimension and a shorter width dimension, the shorter width dimension being smaller than the wavelength of the radiation. Kim [936] does however, teach the apertures in the array having a diameter smaller than the wavelength of radiation. In addition, Kim [936] also teaches that the apertures can various shapes including rectangular. See Kim [936] col. 1 lines 65-67, col. 2 lines 10-35, and col. 5 lines 1-6. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the aperture array be a slit having a long dimension and a shorter width dimension, the shorter width dimension being smaller than the wavelength of the radiation in order to have transmission be proportional to $(d/\lambda)^2$ and allow for better control of the intensity of the transmitted light as taught in Kim [936].

Response to Arguments

Applicant's arguments with respect to claims 1-6,8,21-25 have been considered but are moot in view of the new ground(s) of rejection.

With respect to applicants' argument concerning there not being a target, the examiner would like to draw applicants' attention to figure 8 which clearly exhibits a light source, a perforated metal film unit, and a target (screen).

With respect to applicants' arguments concerning a layer of conductive material that extends into the interior sidewalls of each aperture terminating at the second surface of the barrier in a limited area in the vicinity of each aperture, the examiner would like to point out that (as mention in applicants' arguments) the metal structure containing the apertures and having two sides does in fact inherently have conductive material on the sidewalls of the aperture since the aperture is formed in the material. In addition, since metal is a conductor, it is inherent that the sidewalls would be conductive.

With respect to the applicants' arguments concerning claim 7, there is nothing in the claim to suggest that light barrier is anything other than the metal film. Claim 1 recites, "... a substantially planar light barrier interposed between said source and said target, said light barrier defining a first electrically conductive surface on the side of said barrier exposed to incident light from the source and further defining a second surface on the opposite side of said barrier,...." Essentially, the claim describes an object having two sides, and a hole going through it, and having one side that is conductive. It does not say anywhere in the claims the object must be two separate layers, made of different materials, nor does it state that the second surface must be made of a material that is nonconductive. Therefore the examiner maintains the rejection.

With respect to applicants' argument for claims 14-20 concerning Ebbesen not teaching a confined conductive area in the vicinity of each of the apertures at the exit surface to reduce the area of area of illumination on a target, the examiner considers these arguments moot since this material is not claimed in claims 14-20.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (571)-272-2480. The examiner can normally be reached on Monday thru Friday 9 a.m. to 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571)-272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A. Quash 1/29/04

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